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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/961,255	09/25/2001	Bernard Dieny	213954US2	8064

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EXAMINER	
UHLIR, NIKOLAS J	
ART UNIT	**PAPER NUMBER**
1773	5

DATE MAILED: 02/03/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

AS5

Office Action Summary	Application No.	Applicant(s)	
	09/961,255	DIENY, BERNARD	
	Examiner	Art Unit	
	Nikolas J. Uhlir	1773	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☐ Responsive to communication(s) filed on _____ .

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) 1-12 is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) 1-12 is/are rejected.

7)☒ Claim(s) 2,3 and 10 is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☒ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on 25 September 2001 is/are: a)☐ accepted or b)☒ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

11)☐ The proposed drawing correction filed on _____ is: a)☐ approved b)☐ disapproved by the Examiner.

If approved, corrected drawings are required in reply to this Office action.

12)☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

13)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____ .

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

14)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).

a) ☐ The translation of the foreign language provisional application has been received.

15)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) 4. 9-3
4) ☐ Interview Summary (PTO-413) Paper No(s). _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other:

DETAILED ACTION

Priority

1. Receipt is acknowledged of papers submitted under 35 U.S.C. 119(a)-(d), which papers have been placed of record in the file.

Drawings

2. Figure 1 should be designated by a legend such as --Prior Art-- because only that which is old is illustrated. See MPEP § 608.02(g). A proposed drawing correction or corrected drawings are required in reply to the Office action to avoid abandonment of the application. The objection to the drawings will not be held in abeyance.

Specification

3. The abstract of the disclosure is objected to because it is more than one paragraph. Correction is required. See MPEP § 608.01(b).

Claim Objections

4. Claims 2-3, and 10 are objected to because of the following informalities: The phrase "taken from within the group including" is improper Markush group terminology. The examiner restfully notes that "selected from the group consisting of" is accepted as suitable Markush group terminology. Appropriate correction is required.

Claim Rejections - 35 USC § 102

5. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

6. Claims 1, 3-6, and 9-11 are rejected under 35 U.S.C. 102(b) as being anticipated by Swagten et al. (Physical Review B, Vol 53, Number 14, pp9108-9114).

7. Regarding the limitations of claim 1, wherein the applicant requires a spin valve device comprising at least one stack of layers comprising an electrically conductive, nonmagnetic layer between first (R) and second (R', F) magnetic layers, wherein the first and second magnetic layers have a magnetization in a certain direction and that at least one of the first and second magnetic layers has at the interface with the nonmagnetic layer a specular reflection of the conduction electrons that is dependent on the orientation of the spin of the electrons relative to the magnetization direction in the magnetic layer or layers.

8. To be clear on the record, the applicant should note that the examiner interprets the phrase, "at the interface with the nonmagnetic layer" to allow for additional layers to be present between the spectrally reflecting layer and the nonmagnetic layer.

9. With respect to the limitations of claim 1, Swagten et al. teaches a spin valve device comprising the structure, 500 angstrom NiO/F1/NM1/F2/NM2/100 angstroms NiO, wherein F1 and F2 are 20 angstrom of Co and 40 angstroms of Co respectively and both NM1 and NM2 are manufactured from Cu (p 9108, right column "experiment"). The examiner takes the position that the 1st Co layer is equivalent to applicants claimed 1st magnetic layer, and Co is known to be ferromagnetic. Further, the examiner takes the position that the second NiO layer is equivalent to applicants claimed 2nd magnetic layer, as NiO is antiferromagnetic. As the nonmagnetic layer is between these two layers, this limitation in claim 1 is met. Further, Cu is known to be nonmagnetic and

conductive, and so meets the limitations of claim 1 requiring a nonmagnetic conductive layer. Regarding the requirement that a specular reflection of electrons be present at the interface between the non-magnetic and one of the magnetic layers, Swagten et al. teaches that bottom NiO layer spectrally reflects electrons, whereas the top NiO layer does not (page 9112, left column, line 54-page 9113, left column, line 55). Thus, the limitations of claim 1 are met.

10. Regarding the limitations of claim 3, wherein the applicant requires the electrically conductive nonmagnetic layer to be Cu, Ag, or Au. Swagten uses Cu as the non-magnetic layer. Thus, the limitations of claim 3 are met.

11. Regarding the limitations of claim 4, wherein the applicant requires the non-magnetic layer to have a thickness less than approximately 10nm. Swagten teaches specific examples wherein 20 angstrom (2nm) Cu layers are utilized for the non-magnetic layer. Thus, the limitations of claim 4 are met.

12. Regarding the limitations of claim 5, wherein the applicant requires an antiferromagnetic layer to be adjacent to at least one of the first and second magnetic layers. Swagten teaches using anti-ferromagnetic NiO adjacent the lower (1st) magnetic layer, as stated above for claim 1. Thus, the limitations of claim 5 are met.

13. Regarding the limitations of claim 6, wherein the applicant requires a substrate. Swagten et al. forms the stack on glass substrates (right column, p9108, experimental). Thus, the limitations of claim 6 are met.

14. With respect to the limitations of claim 9, wherein the applicant requires the first magnetic layer to spectrally reflect electrons, wherein the second magnetic layer does

not. Swagten specifically teaches that the lower portion of the stack (NiO/FM1/NM1) spectrally reflects electrons, whereas the upper portion of the stack (NM2/NiO) does not (page 9112, left column, line 54-9113, left column, line 55). Thus the limitations of claim 9 are met.

15. Regarding the limitations of claim 10, wherein the applicant requires the second magnetic layer having transmission of electrons to be formed from a material selected from transition metals, alloys of Ni and/or iron and/or cobalt. Swagten et al. teaches that the second layer having transmission of electrons is made of NiO, as shown above for claims 1 and 9. As Ni is a transition metal, the limitations of claim 10 are met.

16. Regarding the limitations of claim 11, wherein the applicant requires a ferromagnetic layer to be adjacent to the second magnetic layer, this limitation is met as set forth above, as Swagten et al. teaches a ferromagnetic Co layer adjacent to the upper antiferromagnetic NiO layer.

Claim Rejections - 35 USC § 103

17. Claims 1-3, 5-6, and 8 are rejected under 35 U.S.C. 103(a) as being unpatentable over Singleton et al. (US2002/0012207A1).

18. As stated above, the examiner interprets claim 1 to allow for additional layers to be present between the non-magnetic layer and the specular reflecting layer.

19. With respect to the limitations of claim 1, Singleton et al. teaches a spin valve having the structure Seed/ Antiferromagnetic layer/ Specular scattering layer/pinned layer/spacer/free layer/specular scattering layer (figure 1a). Both the pinned and the free layers are ferromagnetic, and the spacer layer is non-magnetic. The specular

scattering layers are made from antiferromagnetic materials such as NiO, Fe_2O_3 and Fe_3O_4, and others (section 8).

20. Therefore it would have been obvious to one with ordinary skill in the art to select NiO, Fe_2O_3 or Fe_3O_4 to form the scattering layers in Singleton et al., as they are taught to be equivalent.

21. The applicant is respectfully reminded that substitution of equivalents requires no express motivation as long as the prior art recognizes the equivalency. *In Re Fount* 213 USPQ 532 (CCPA 1982); *In Re Siebentritt* 152 USPQ 618 (CCPA 1967); *Grover Tank & Mfg. Co. Inc V. Linde Air Products Co.* 85 USPQ 328 (USSC 1950)

22. It is the examiners position that when NiO, Fe_2O_3 or Fe_3O_4 are used as the specular scattering layers, the magnetic layer limitations of claim 1 are met, as these materials are known to be magnetic.

23. Regarding the limitations of claim 2, wherein the applicant requires the magnetic layer or layers R R' to be formed from one of the materials selected from ferrimagnetic oxides based on iron and/or nickel and/or cobalt and/or chrome or ferromagnetic nitrides based on iron and/or nickel and/or cobalt.

24. It would have been obvious to one with ordinary skill in the art at the time the invention was made to select Fe_3O_4 as the material for the scattering layers, as it is taught to be equivalent to the other materials listed as suitable. It is the examiners position that when Fe_3O_4 is used as the material for the scattering layers, the limitations of claim 2 are met, as Fe_3O_4 is a known ferrimagnetic oxide.

25. Regarding the limitations of claim 3, wherein the applicant requires the nonmagnetic layer to be selected from Cu, Ag, or Au. Singleton teaches that the spacer layer is an alloy of Cu (section 25). Thus this limitation is met.

26. With respect to the limitations of claim 5, wherein the applicant requires an antiferromagnetic layer to be adjacent one of the first and second magnetic layers. As stated above for claim 1, Singleton teaches a structure which has an antiferromagnetic layer adjacent one of the specular scattering layers. Thus, when NiO, Fe_2O_3 or Fe_3O_4 is utilized as the specular reflection layer (thus meeting applicants magnetic layer requirements), the limitations of claim 5 are met.

27. Regarding claim 6, wherein the applicant requires the stack of layers to be deposited on a substrate. The examiner takes the position that the seed layer of Singleton et al. is equivalent to applicants claimed substrate. Thus, this limitation is met.

28. Regarding the limitations of claim 7, wherein the applicant requires a protective layer. Singleton et al. teaches a top spin valve structure in which the antiferromagnetic layer is deposited on top of the second specular scattering layer (see figures 2a and 2b). It is the examiners position that when the antiferromagnetic layer is formed on top of the second scattering layer it is equivalent to applicants protective layer.

29. Regarding claim 8, wherein the applicant requires the both magnetic layers to spectrally reflect electrons. This limitation is met as set forth above for claim 2, as Singleton et al. clearly teaches the use of 2 spectral reflection layers.

30. Claim 12 is rejected under 35 U.S.C. 103(a) as being unpatentable over Swagten et al.

31. Swagten does not explicitly teach a spin valve having the structure R/NM/F/NM/R', wherein R and R' are magnetic layers which exhibit specular reflection of electrons, F is a magnetic layer which exhibits diffusion of electrons, and NM is a nonmagnetic conductive spacer layer, as required by claim 12.

32. However, Swagten et al. does teach that replacing the top NiO layer with an antiferromagnetic CoO layer would allow the spin dependent specular reflection of electrons at the upper boundary as a function of temperature to be studied (left column page 9113).

33. Therefore it would have been obvious to one with ordinary skill in the art to replace the upper NiO layer of Swagten with an antiferromagnetic CoO layer.

34. One would have been motivated to make this modification in order to explore the mechanism which governs the spin dependent reflection of electrons at the upper barreir of the spin valve structure of Swagten et al.

35. When CoO is used to replace the upper NiO layer of Swagten, this results in a spin valve having the structure, NiO/F1/NM1/F2/NM2/CoO, wherein NiO and CoO layers reflect electrons. As F2 is a ferromagnetic material such as cobalt, and is not taught to reflect electrons, the limitations of claim 12 are met, as this would result in a structure reading on applicants claim language.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Nikolas J. Uhlir whose telephone number is 703-305-0179. The examiner can normally be reached on Mon-Fri 7:30 am - 5 pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Paul Thibodeau can be reached on 703-308-2367. The fax phone numbers for the organization where this application or proceeding is assigned are 703-872-9310 for regular communications and 703-872-9311 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-305-0389.

nju
January 22, 2003

STEVAN A. RESAN
PRIMARY EXAMINER